CLAIMS

What is claimed is:

1.

A transfer and positioning apparatus for positioning a specimen container carried in a specimen carrier at a predetermined position along a first conveyor of a dual conveyor track and for transferring the carrier between the two conveyors, the track of the type having first and second parallel, spaced apart conveyors with upper surfaces within a single plane, the conveyors operable in the same longitudinal direction, the transfer and positioning apparatus comprising:

a positioning assembly mounted between the conveyors at a predetermined processing location, for positioning a specimen container within a carrier at a reference location;

a lane changer mounted between the conveyors downstream of the positioning assembly, for selectively transferring a specimen carrier between the first and second conveyors; and

a command module with a processor electrically connected to and programmed to operate the positioning assembly and the lane changer;

said positioning assembly including:

an assembly housing mounted between the conveyors;

a retractable shaft in a forward wall of the assembly housing, operable between an extended position extending over the first conveyor to prevent

downstream movement of a carrier on the first conveyor, and a retracted position permitting downstream movement of a carrier;

a pair of first and second gripper arms operably mounted within the assembly housing and operable for simultaneous movement between an open position and a closed position, the open position having the first arm located downstream of the reference location and the second arm located upstream of the reference location with both arms spaced from a path of a specimen container on the conveyor to permit carriers with specimen containers to move past the gripper arms, the closed position having the first and second gripper arms in contact with a specimen container and locating the specimen container at the reference location; and

a motor in said housing connected to the arms and operable to selective move the arms between the open and closed positions;

said motor electrically connected to the command module processor and responsive to operate the gripper arms in response to instructions transmitted from the processor.

said lane changer comprising:

a frame connected to the track downstream of the positioning assembly, for supporting an operable shuttle;

a shuttle operably connected to the frame to move transversely between the conveyors and generally perpendicular to the movement of specimen carriers on the conveyors;

a first stop member on said frame, projecting partially over the first conveyor;

a second stop member on said frame, projecting partially over the second conveyor;

said shuttle having a pair of parallel arms spaced apart a distance to receive a specimen carrier therebetween;

said shuttle operable to a first "hold" position with the shuttle arms located such that a specimen carrier therebetween is in contact with the first stop member, to thereby prevent downstream movement of a carrier on the first conveyor;

said shuttle operable to a first "release" position with the shuttle arms located such that a specimen carrier therebetween bypasses the first stop member and is moved downstream through the shuttle arms on the first conveyor;

said shuttle operable to a second "release" position with the shuttle arms located such that a specimen carrier therebetween bypasses the second stop member and is moved downstream through the shuttle arms on the second conveyor; and

a drive assembly on the frame electrically connected to the command module processor, for selectively moving the shuttle among the first "hold" position, the first "release" position and the second "release" position; and

said command module processor programmed according to predetermined rules and guidelines for the processing of specimens within containers on carriers on the track; and

said command module processor programmed to provide operating instructions to the lane changer and positioning assembly.

2.

The transfer and positioning apparatus of claim 1, wherein said positioning assembly further includes a sensor adjacent the retractable shaft to detect the presence of a carrier at said retractable shaft, said sensor electronically connected to the command module for transmitting detection information thereto.

3.

The transfer and positioning apparatus of claim 1, wherein said positioning assembly further includes a scanner in said housing oriented to scan a specimen carrier restrained by the retractable shaft, to collect identification data therefrom, said scanner electrically connected to the command module and adapted to transmit identification data to the command module.

4.

The transfer and positioning apparatus of claim 1, wherein said positioning assembly gripper arms are pivotally mounted at rearward ends thereof for movement of forward ends through a generally horizontal plane.

5.

The transfer and positioning apparatus of claim 4, wherein said positioning assembly gripper arms are operably interconnected at their rearward ends for simultaneous movement of the forward ends in opposing directions.

6.

The transfer and positioning apparatus of claim 1, wherein the forward ends of the gripper arms each have a contact surface for contacting the specimen container.

7.

The transfer and positioning apparatus of claim 6, wherein each contact surface has a shape that will position the container along a longitudinal axis of the first conveyor track when the arms are moved to the closed position.

8.

The transfer and positioning apparatus of claim 1, wherein said shuttle is operable to a second "hold" position with the shuttle arms located such that a specimen carrier therebetween is in contact with the second stop member to thereby prevent downstream movement of a carrier on the second conveyor, and wherein said drive assembly additionally selectively moves the shuttle to the second "hold" position.

9.

The transfer and positioning apparatus of claim 8, wherein said lane changer frame further includes a first sensor located to detect the presence of a carrier within the arms of the shuttle in the first "hold" position, said sensor electronically connected to the command module for transmitting detection information thereto.

10.

The transfer and positioning apparatus of claim 9, wherein said lane changer frame further includes a second sensor located to detect the presence of a carrier within the arms of the shuttle in the second "hold" position, said sensor electronically connected to the command module for transmitting detection information thereto.

11.

The transfer and positioning apparatus of claim 10, wherein said frame further includes a first exit sensor located downstream of the first lane changer sensor along the first conveyor, to detect the presence of a carrier that has exited the arms of the shuttle in the first "release" position, said sensor electronically connected to the command module for transmitting detection information thereto.

12.

The transfer and positioning apparatus of claim 11, wherein said lane changer frame further includes a second exit sensor located downstream of the second lane changer sensor along the second conveyor, to detect the presence of a carrier that has exited the arms of the shuttle in the second "release" position, said sensor

electronically connected to the command module for transmitting detection information thereto.

13.

The transfer and positioning apparatus of claim 1, further comprising a queue positioned upstream of said positioning assembly and mounted between said conveyors, for selectively restraining specimen carriers on the conveyors upstream of the positioning assembly and lane changer and selectively releasing a specimen carrier from one of said conveyors in response to instructions from the command module, said queue electronically connected to the command module to receive instructions therefrom.

14.

The transfer and positioning apparatus of claim 13, wherein said queue includes:

a housing mounted between the conveyors;

a first retractable shaft projecting from a downstream end of the queue housing and over the first conveyor, to restrain a specimen carrier from movement along the first conveyor when extended;

a motor in said queue housing connected to said queue first shaft for selectively extending and retracting said shaft, said motor electrically connected to the command module and responsive to instructions from the command module;

a second retractable shaft projecting from a downstream end of the queue housing and over the second conveyor, to restrain a specimen carrier from movement along the second conveyor when extended;

said motor in the queue housing connected to said second shaft for selectively extending and retracting said shaft;

a first queue sensor adjacent said first queue shaft for detecting the presence of a specimen carrier restrained by the first queue shaft;

said first queue sensor electrically connected to the command module and adapted to transmit detection data to the command module; and

a second queue sensor adjacent said second queue shaft for detecting the presence of a specimen carrier restrained by the second queue shaft;

said second queue sensor electrically connected to the command module and adapted to transmit detection data to the command module.

15.

The transfer and positioning apparatus of claim 14, wherein said queue first and second shafts are connected together, such that the retraction of one shaft causes the extension of the other, whereby no more than one specimen carrier may be released at a time by the queue.

16.

The transfer and positioning apparatus of claim 15, wherein said queue further includes:

a first queue scanner adjacent said first queue shaft for scanning a specimen carrier restrained by the first queue shaft, to collect identification data therefrom;

said first queue scanner electrically connected to the command module and adapted to transmit identification data to the command module; and

a second queue scanner adjacent said second queue shaft for scanning a specimen carrier restrained by the second shaft, to collect identification data therefrom;

said second queue scanner electrically connected to the command module and adapted to transmit identification data to the command module.

17.

The transfer and positioning apparatus of claim 16, wherein said first queue scanner is activated to scan in response to the detection of the presence of a specimen carrier by the first queue sensor, and wherein the second queue scanner is activated to scan in response to the detection of the presence of a specimen carrier by the second queue sensor.

18.

The transfer and positioning apparatus of claim 17 wherein said queue further includes:

a third retractable shaft projecting from an upstream end of the queue housing and over the first conveyor, to restrain a specimen carrier from movement along the first conveyor when extended;

a second queue motor in said queue housing connected to said third queue shaft for selectively extending and retracting said shaft, said second queue motor electrically connected to the command module and responsive to instructions from the command module;

a fourth retractable shaft projecting from an upstream end of the queue housing and over the second conveyor, to restrain a specimen carrier from movement along the second conveyor when extended;

said second queue motor connected to said fourth queue shaft for selectively extending and retracting said shaft;

a third queue sensor adjacent said third queue shaft for detecting the presence of a specimen carrier restrained by the third queue shaft;

said third queue sensor electrically connected to the command module and adapted to transmit detection data to the command module; and

a fourth queue sensor adjacent said fourth shaft for detecting the presence of a specimen carrier restrained by the fourth queue shaft;

said fourth queue sensor electrically connected to the command module and adapted to transmit detection data to the command module.